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Research Article

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Fertility status of soils of Girgadhda and Una taluka of Gir Somnath district

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Summary

Total 215 numbers of representative surface (0-15 cm) soil sample had been collected to check fertility status under Soil Health Card Programme form cultivated farmers's field of Girgadhda and Una taluka of Gir Somnath district during 2015. The chemical analysis of 215 surface samples indicates that soil were medium in OC and also medium in available P_2O_5, K_2O and S. Among the DTPA extractable micronutrients, Mn and Cu were found sufficient, whereas the soils were medium in Fe and Zn. The nutrient index values were low for Zn (1.45), medium for OC (1.98), P_2O_5 (1.85), K_2O (1.98), S (2.01), Fe (1.53) and Mn (2.31) and high for Cu (3.00) in the Girgadhda and Una Taluka of Gir Somnath district.

Key words : Available macronutrients, DTPA extractable micronutrients, Nutrient index

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Introduction

Soil fertility has a direct relation with the crop yields, provided other factors are in optimum level. Soil fertility must be periodically estimated as there is continuous removal of macro and micro nutrients by the crop intensively grown in every crop season. In order to achieve higher productivity and profitability, every farmer should realize that fertility levels must be measured as there measurement can then be used to manage soil fertility. Balanced nutrient use ensures high precaution level and helps to maintain the soil health. Fertilizing the soils to bring all the deficient elements at high levels as to provide sufficient ionic activity in soil solution for crop uptake is one of the most important consideration for maximization of the crop yield. Such type of information at broad villages level were lacking in Gir Somnath district of Gujarat. Therefore, an attempt has been made to study fertility status of Costal cultivated farmer's field under soil health card programme for two important talukas *viz*., Girgadhda and Una talukas of Coastal Gir Somnath district in Gujarat.

Resource and Research Methods

Total two hundred fifteen surface soil samples (0-15 cm) were collected from Girgadhda and Una talukas of Gir Somnath distrct during Nov. 2015. Soil samples were air dried, ground carefully with a porcelin mortar and pastel to break soil lumps and passed through 2 mm sieve. Organic C by wet digestion method (Walkley and Black's rapid titration method, 1934) and (Walkley and Black, 1935), available phosphorus was extracted by 0.5M $NaHCO_3$ solution buffer at pH 8.5 (Olsen *et al.*,1954) and phosphorus in the extract was determined by using ammonium molybdate and working solution of stannous chloride than P extracted by spectrophotometer, available potassium (Jackson, 1973) was extracted by shaking with neutral normal ammonium acetate for 5 minutes (Hanway

and Heidal, 1952) and then K in the extract was estimated by flame photometer and S was determined as per the methods described by Williams and Stainbergs (1959), while DTPA extractable micronutrients were determined by atomic absorption spectrophotometer as per method outline by Lindsay and Norvell (1978). The nutrient index (NI) values for available nutrients present in the soils were calculated utilizing the formula as suggested by Parkar *et al*. (1951) and classified this index as low (< 1.5), medium (1.5 to 2.5) and high (> 2.5) giving under weightage to medium category. Ramamoorthy and Bajaj (1969) modified the index classification as low (< 1.66), medium (1.67 to 2.33) and high (> 2.33).

$$\text{Nutrient index} = \frac{(N1 \times 1)(Nm \times 2)(Nh \times 3)}{Nt}$$

where, Nl, Nm and Nh are the number of soil samples falling in low, medium and high categories for nutrient status and are given weightage of 1, 2 and 3, respectively. Nt is the total number of samples.

Research Findings and Discussion

The data analysis for macro and micro nutrients obtained from present analysis are presented in Table 1. The highest value in macro nutrient organic carbon (1.11 %), K_2O (760 kg ha^{-1}) were observed in Una Taluka whereas available P_2O_5 (285 kg ha^{-1}) was observed in Girgadhda taluka of Gir Somnath district. Similar finding were reported by for available K_2O by Polara and Chauhan (2015). While highest value of sulphur (22.70 mg kg^{-1}) was observed in Girgadhda taluka. For micronutrients highest value of Zn^{++} (4.98 mg kg^{-1}) and Cu^{++} (3.16 mg kg^{-1}) were observed in Una taluks and Fe^{++} (14.06 mg kg^{-1}) and Mn^{++} (27.0 mg kg^{-1}) were observed in Girgadhda Taluka of Gir Somnath district. Similar finding were reported by for Fe^{++} by Polara and Chauhan (2015). The lowest values for OC (0.12 %) were observed in one of the sample in both taluka of Gir Somnath district and lowest value for P_2O_5 (6 kg ha^{-1}) and S (9.50 mg kg^{-1}) were observed in Una taluka while lowest value for K_2O (22 kg ha^{-1}) and DTPA extractable micronutrient Fe^{++} (0.72 mg kg^{-1}), Zn^{++} (0.20 mg kg^{-1}), Mn (0.96 mg kg^{-1}) and Cu (0.46 mg kg^{-1}) were observed in Girgadhda taluka of Gir Somnath district. In general soils of both taluka were medium in OC, P_2O_5, K_2O, S, Fe^{++} and Zn^{++} whereas high in Mn^{++} and Cu^{++}. Overall value for OC ranged from 0.12 to 1.11 per cent with mean value of 0.61 per cent, P_2O_5 ranged from 6 to 285 kg ha^{-1} with mean value of 56 kg ha^{-1}, K_2O ranged from 22 to 760 kg ha^{-1} with mean value of 220 kg ha^{-1}, S ranged from 9.50 to 22.70 mg kg^{-1} with mean value of 14.32 mg kg^{-1}, Fe^{++} ranged from 0.72 to 14.06 mg kg^{-1} with mean value of 5.33 mg kg^{-1}, Zn^{++} ranged from 0.20 to 4.98 mg kg^{-1} with mean value 0.57 mg kg^{-1}, Mn^{++} ranged from 0.96 to 27.0 mg kg^{-1} with mean value of 10.8 mg/kg and Cu^{++} ranged from 0.46 to 3.16 mg kg^{-1} with mean value of 1.29 mg kg^{-1}. None of the samples for Cu^{++} fall in low and medium categories. Results reported in the present investigation find supports from the work reported elsewhere (Maliwal and Timbadia 1993 and 2000; Sharma *et al.*, 2001; Pal *et al.*, 2002 and Anonymous, 2004). Some of the sample indicated lowest value for macro and micro nutrient due to use of intensive cropping system and less use of FYM in crops and due to high absorption of plant nutrients by crops. The medium range of available potassium content were generally due to the presence of potassium bearing minerals (like –

Table 1 : Range and mean value of available macro and micronutrient in irrigated surface soils of Girgadhda and Una taluka of Gir Somnath district

Name of taluka	%	kg ha^{-1}		mg kg^{-1}	DTPA extractable morconutrients in mg kg^{-1}			
	OC	P_2O_5	K_2O	S	Fe^{++}	Zn^{++}	Mn^{++}	Cu^{++}
Girgadhda	0.12 - 1.02	7 - 285	22 - 583	10.20-22.70	0.72-14.06	0.20-3.44	0.96-27.0	0.46-2.38
	(0.51)*	(56)	(166)	(14.33)	(4.91)	(0.43)	(10.95)	(1.30)
Una	0.12 - 1.11	6-272	42-760	9.50-20.30	1.40-13.92	0.24-4.98	2.54-26.42	0.50-3.16
	(0.70)	(56)	(270)	(14.31)	(5.71)	(0.69)	(10.67)	(1.28)
Overall	0.12-1.11	6-285	22-760	9.50-22.70	0.72-14.06	0.20-4.98	0.96-27.0	0.46-3.16
	(0.61)	(56)	(220)	(14.32)	(5.33)	(0.57)	(10.8)	(1.29)

* Value in parenthesis indicates mean values

Table 2 : Nutrient index values of available nutrient status of irrigated soils of Girgadhda and Una taluka of Gir Somnath district

Nutrient index	Macronutrients				Micronutrients			
	OC	P_2O_5	K_2O	S	Fe^{++}	Zn^{++}	Mn^{++}	Cu^{++}
Girgadhda	1.74	1.83	1.65	2.02	1.48	1.20	2.33	3.00
Una	2.22	1.87	2.31	1.99	1.58	1.70	2.29	3.00
Overall	1.98	1.85	1.98	2.01	1.53	1.45	2.31	3.00

muscovite, biotite and feldspar etc.) which on weathering slowly release potash, release of labile-K from organic residues of cultivated crop plants and upward translocation of K from lower depth along with capillary rise of ground water (Malavath and Mani, 2014). The results of the present investigation are in according with those reported by Gupta *et al.* (1991) who reported medium K in soils of Chambal command area of Rajasthan. Similar finding were reported by Ghosh and Hassan (1976) and Singh (2014). The soils of Gir Somnath district were high in available Mn^{++} and Cu^{++}, whereas medium in Zn^{++} and Fe^{++}. The DTPA extractable Fe^{++}, Zn^{++}, Mn^{++} and Cu^{++} ranged from 0.72 to 14.06, 0.20 to 4.98, 0.96 to 27.0 and 0.46 to 3.16 mg kg^{-1} with mean value of 5.33, 0.57, 10.8 and 1.29 mg kg^{-1}, respectively. These results are in agreement with the finding of Polara and Kabaria (2006); Malavath and Mani (2014) and Polara and Chauhan (2015). Based on nutrient index values of soils (Table 2) and the criteria as suggested by Parkar *et al.* (1951), the soils Girgadhda and Una taluka of Gir Somnath district were medium for OC (1.98), available P_2O_5 (1.85), available K_2O (1.98) and available S (2.01), DTPA extractable nutrient low for Zn (1.45) medium for Fe (1.53) and Mn (2.31) and high for Cu (3.00), while as per criteria suggested by Ramamoorthy and Bajaj (1969) similar results were found. These results confirmed the finding as reported by Polara and Kabaria (2006) for soils of Amreli district, Rajput and Polara (2012) for Bhavnagar district of Gujarat and Malavath and Mani (2014) for Shivaganga district of Tamil Nadu.

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